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**Information for Property  
Holders Concerning Pavements**

**Civil Engineering**

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**1912**



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**INFORMATION FOR PROPERTY HOLDERS  
CONCERNING PAVEMENTS**

**BY**

**EDWARD FRANCIS MOTSINGER**

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**T H E S I S**

**FOR THE**

**DEGREE OF BACHELOR OF SCIENCE**

**IN**

**CIVIL ENGINEERING**

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**COLLEGE OF ENGINEERING**

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COLLEGE OF ENGINEERING.

May 24, 1912

This is to certify that the thesis of EDWARD FRANCIS  
MOTSINGER entitled INFORMATION FOR PROPERTY HOLDERS CONCERNING  
PAVEMENTS was prepared under my personal supervision; and I recom-  
mend that it be approved as meeting this part of the requirements  
for the degree of Bachelor of Science in Civil Engineering.

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Professor of Civil Engineering.





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## INFORMATION FOR PROPERTY HOLDERS CONCERNING PAVEMENTS

### INTRODUCTION

Since the laws in this state, and possibly those of other states, give the property owner the power to select the kind of pavement, it is desirable that he have the knowledge necessary to make a wise choice. Therefore it is proposed in this thesis to discuss the subject of pavements in such a manner as to give the property holder the necessary information whereby he may intelligently exercise the powers given to him by law.

### I THE PROPERTY HOLDER'S SAFEGUARD

When a paving improvement is proposed, the law provides four methods by which the property holder may protect his interests. These methods may be briefly designated as follows: (1) the petition; (2) the hearing before the Board of Local Improvements; (3) the opportunity to appear before the City Council; and (4) the opportunity for a hearing in court.

1. Petition. When property holders desire a pavement in front of their property a petition is circulated among persons who have property abutting on the proposed improvement, the object of such petition being to ascertain the desire of the majority. A person who signs this petition signifies by that act that he is willing to have the improvement made and will pay his share of the cost. In Illinois it is the rule that if more than fifty per cent. of the frontage is





represented on the petition, the Board of Local Improvement, or similar Board, will recommend to the City Council that the improvement be made. In some states it is not necessary to have the consent of the majority of property holders, as the law states that when in the opinion of the local authorities an improvement is necessary for the good of the public, such improvement shall be made regardless of the wishes of the property holders directly concerned.

2. Hearing Before the Board of Local Improvements.

The Board of Local Improvements in smaller cities of Illinois consists of the Mayor, the City Engineer, and the Superintendent of Streets. After the petition has been circulated, a notice is sent to each property holder notifying him that on a certain date the Board will meet and that at that time he may state his views for or against the proposed improvement. He is free to suggest his ideas upon the kind of pavement; and if the majority present agree upon a specific kind of pavement, it shall be constructed. Thus the property holder has a voice in choosing the kind of pavement.

3. Hearing Before the City Council. If any property holder feels that his rights have been trespassed upon, he has the opportunity to state his grievance before the City Council. By this method a property holder has the opportunity to cause any decision made by the Board of Local Improvements to be reviewed.

4. Hearing in Court. Often a property holder must appeal to the court for justice in regard to a paving project; but it is not advisable because it usually involves a considerable





expense. It would be good policy to carefully examine the laws of the state concerning paving improvements before taking the case to court.

## II SPECIAL ASSESSMENTS

"A special assessment may be defined as a compulsory contribution paid once and for all to defray the cost of a specific improvement to property, undertaken in the public interest, and levied by the government in proportion to the special benefits accruing to the property owner. Special assessments differ from taxes, both general and special, in that the former are based upon a direct benefit conferred to the property owner, which is a measure of his liability to be taxed, while taxes are levied for the maintenance of institutions and interests of the government without any reference to benefits conferred to the tax payer. The principle of paying for pavements by special assessments is a growth occasioned by public necessity, and is firmly established in the economics of the republic."

In a general way there are four methods of proportioning the amount to be paid by property owners: (1) according to the frontage upon the improvement; (2) according to the area; (3) according to the value of the property; and (4) according to the position of the property in the block.

5. Frontage Rule. By far the most common method of proportioning the cost of an improvement is pro rata according to the frontage. This method is often called the front-foot rule. Distributing the cost by this rule is usually an equitable one, but under some circumstances a strict adherence



to the rule gives anomalous results. For example, if most of the lots have their shorter side on the improvement and one has its longer side thus placed, the front-foot rule will give inequality, especially if the latter lot is very narrow.

6. Area Rule. The cost of a pavement is sometimes distributed in proportion to the area of the abutting lots. This method is seldom used except on curved streets. Corner lots are usually the cause of irritation under the area rule, because a portion of the property is assessed that has no improvement to compensate for the assessment.

7. According to Value. Perhaps some of the difficulties of proportioning cost could be overcome by distributing the cost of a pavement according to the value of the property. It is equitable that the more valuable a lot is, the more it will be benefitted by the improvement; and therefore a rate could be established based upon the value of any property facing the pavement.

8. According to Position in the Block. It has been suggested that the cost of a pavement could be distributed according to the position of the lot in the block. Some persons advocate that as the corner lots are more valuable than those near the middle of the block, they should be assessed accordingly. The persons owning corner lots say that those owning lots near the middle of the block are benefitted as much as they, and therefore should be assessed accordingly.

It is difficult to state just which method is advisable, as there are features about each which are commendable. It suffices to say that any method may require modification for





unusual conditions.

9. Apportionment of Cost. After it has been decided that a pavement will be put in, the question that naturally follows is - who is going to pay for the improvement? There are at least three distinct views taken in this question: (1) A few people offer the argument - I do not own a horse, vehicle, or automobile, therefore why should I pay for any part of the improvement? Admit that the pavement is not used by the resident, he is still obligated to pay his share, for the pavement is used by those who serve him and the resident receives other benefits besides those pertaining to travel. Therefore it is not practical to distribute the cost according to the use of the pavement.

(2) Others claim that the pavement is for the use of the public in general and therefore the owners of the abutting property should pay no more than property owners in other parts of the city. It has been proven time and time again that the abutting property is increased in value as a result of paving. Also, the sanitary conditions are improved. These two facts alone are sufficient to show that the owners of abutting property are receiving direct benefits as a result of the improvement and should bear their share of the cost of a pavement.

(3) Many say that the abutting property receives the benefits and therefore should pay the entire cost. This is an erroneous idea, because it entirely disregards the fact that the pavement is for the use of the general public and benefits all the people. Any improvement in any part of the city indirectly benefits the entire city, and therefore no objection should be made to





letting every property holder pay a part of his share as the improvement progresses, instead of being required to pay it in a lump sum when the street in front of his property is paved.

Seldom, if ever, is the expense of an improvement proportioned according to the character of the street, but it would be right and just if such an apportionment could be made upon an equitable basis. The following example could be used in determining the portion to be paid by the City and the property holder. (1) As has been shown, when a residence street is paved the property holder receives direct benefits and therefore should pay the largest share of the expense, say eighty per cent. (2) In paving a business street the public should pay fifty per cent. as the whole city is benefitted. (3) The expense of paving a thoroughfare should be borne largely by the public because it is devoted largely to the use of all classes of people. It is unfair to charge the private property for the entire cost of paving; it is also unfair to say that the city should bear the entire expense; but it is equitable and just that the cost be borne jointly by the private property and the city at large, since the cost falls upon both interests which are benefitted directly.

### III WIDTH OF PAVEMENTS

There are no definite rules by which the width of a pavement could be established, but it is certain that the cost of construction and the amount and nature of traffic will have some bearing upon the question of the proper width.

It is good policy to make the street wide in a residence district, because its future character can not be foretold. A



residence street may become one of heavy traffic; and a street seldom used at the present time may become a thoroughfare. The wider the pavement the better, except for first cost. However, it is not necessary that a pavement should cover the entire width of a street. It is the custom of some cities to have a grass plot or lawn between the sidewalk and the pavement, in which may be planted trees and shrubs. Such a grass plot places the residence farther from the noise and dust of the street, and also provides a convenient place for hydrants, telephone and electric poles, etc. that would otherwise probably be placed upon the property to its serious detriment.

It is readily admitted that pavements are both desirable and necessary; but many times it is impossible to get a pavement where it is badly needed because the money question looms larger to the property holder than it really is. It is this unwillingness on the part of some people that retards the progress of improvements.

Streets may be divided into two classes: (1) the residence street; and (2) the business street. Further, there are two classes of residence streets, i. e. those that contain a car track and those that do not. The business streets also are divided into two classes the same as for residence streets.

On a residence street without a car track a width of pavement of twenty feet is sufficient. A width of pavement of twenty feet permits a vehicle to stand at the curb on either side of the pavement, and if they are directly opposite, a third vehicle could pass in the remaining space without interfering with the other vehicles.

On a residence street containing a car track, it is





advisable to use a minimum width of pavement of thirty feet. This width will satisfy the requirements of an extreme test; viz.: a car can pass when one vehicle is standing at the curb and a vehicle pass between the car and the stationary vehicle with no serious interference under these conditions.

On a business street that does not contain a car track, the width of pavement must be greater than that of the residence street, because in all probability the business street is a central line of travel. The minimum width advisable is forty feet.

On a business street that contains a car track the width of a pavement varies with conditions and no general rule can be stated. However, it has been found that fifty feet is a good width of pavement in a business street containing a car track.

#### IV COMPARISON OF PAVEMENTS

10. Requirements of an Ideal Pavement. The perfect pavement is purely an ideal which will never be attained, since some of the qualities in a perfect pavement are antagonistic with each other. First, the requirements of an ideal pavement will be discussed; and second, a classification of the merits and defects of the various pavements.

A perfect pavement should satisfy the following conditions:

1. It should be low in first cost.
2. It should have a smooth, hard surface so as to lessen tractive resistance and permit easy cleaning.
3. It should afford a good foothold for horses.
4. It should not be noisy.



5. It should yield neither dust nor mud, but these qualities are difficult to make a reality.

6. It should be impervious so as to permit the removal of all liquids that may come upon it, thereby improving sanitary conditions.

7. It should not absorb heat to such an extent as to prove a nuisance.

11. Merits and Defects of Different Pavements. It is essential that the property holder should know something of the relative merits and defects of the various kinds of pavement, in order that he may choose with intelligence the kind desired. Pavements have been constructed of a great variety of materials, but the only pavements of importance now constructed are: asphalt, brick, stone block, wood block, and tar macadam. It is hardly possible that any other paving material of importance will be introduced in the near future.

Each of the types of pavements mentioned above will now be discussed.

1. Brick Pavement. Perhaps the most common form of pavement is the brick pavement. A brick pavement has many attractive features that should be of interest to the property holder. They are as follows: (1) In comparison with other paving materials, brick are cheaper. (2) The brick may be taken up in order that pipes may be repaired and replaced easily without expert labor. (3) The brick provide a good foothold for horses. (4) Brick can be laid on any grade. (5) Brick are not especially noisy. (6) Brick have a life of about ten years, therefore they are durable. (7) The dust coming from brick pavement is so small





that it is inoffensive. (8) The brick can be cleaned easily and cheaply. (9) A brick pavement presents an appearance that is decidedly pleasing.

The chief disadvantage of a brick pavement is that the edges of the brick chip off, thereby causing the surface of the pavement to become rough.

2. Sheet Asphalt Pavement. The advantages possessed by this kind of pavement are: (1) The asphalt is comparatively noiseless. (2) Very little mud or dust is produced by the asphalt. (3) The asphalt provides a reasonably good foothold for horses. (4) All liquids coming on the surface of the asphalt are easily discharged to the gutters and sewers. (5) The sheet asphalt pavement is easily cleaned.

The disadvantages of sheet asphalt are: (1) Compared with other kinds of pavement, sheet asphalt pavement has a large first cost. (2) The cost of maintenance is large in cities where no asphalt plant exists. (3) The surface of sheet asphalt pavement is too smooth for steep grades. (4) The sheet asphalt becomes sticky under excessive heat.

3. Stone Block Pavement. This kind of pavement is best adapted to streets that must accommodate heavy traffic. A commendable feature about the stone block pavement is its durability. Stone blocks do not decay nor wear out entirely, but the blocks wear rounding and get displaced so that the pavement becomes rough. Stone block pavement is hard to keep clean and



even the best stone block pavement is rough and noisy.

4. Wood Block Pavement. This form of pavement has become popular in the last ten years for residence streets. Wood block pavements are of two classes: (1) rectangular blocks; and (2) round blocks. The merits of rectangular wood block pavement will first be discussed, followed by a similar discussion of round wood block pavement.

4a. Rectangular Wood Block Pavement. The merits of this kind of pavement are: (1) The wood blocks are practically noiseless. (2) The surface presented is very smooth. (3) The blocks are very durable as some blocks have shown no effects of traffic after twenty-five years of service. (4) If preserved, the blocks are impervious, thereby facilitating the prompt discharge to the sewers of all liquids coming on their surface. The principal objections made to this kind of pavement are: (1) The fact that the blocks are liable to become slippery, and (2) The wood block pavement has a very large first cost.

4b. Round Wood Block Pavement. Round wood block pavement is advisable only when low first cost is absolutely necessary. It is not the kind of pavement the property holder would desire abutting his property. The coal tar that is put over the blocks is affected by the atmosphere and the excessive heat in summer, and often becomes sticky.

The question of selecting the kind of pavement is often left to the property holder. The preceding suggestions may be of some value to property holders in deciding upon what kind of pavement they desire.





## V PAVEMENT ECONOMICS

12. Benefits of Pavements. It is difficult to enumerate all the benefits of pavements upon city life, but it will be of advantage to mention some of the more important benefits resulting from the construction of pavements. The principal advantages are:

(1) Good pavements provide a smooth surface thereby lessening tractive power.

(2) They increase fire protection. The smooth surface of the pavement allows the fire apparatus to get to its destination more quickly than it would upon the rough surface of an unpaved street.

(3) Usually sidewalks and grades of lots are established in reference to the pavement, and having a pavement fixes a permanent grade.

(4) Without question pavements improve the sanitary conditions of a community, as they are less dusty in dry weather and less muddy in wet weather than the unpaved street.

(5) Pavements permit driving at all times of the year by presenting a uniform surface.

(6) Pavements allow the use of the bicycle which is a common means of transportation for many persons.

(7) The value of the property abutting upon the pavement is increased, and even property in close proximity to the pavement will demand a higher selling value than it would if there were no pavement.

The advantages mentioned above are both financial



and sanitary. The financial advantage is more evident in the business district, while the residence district receives a marked improvement in sanitary conditions and the people in the district benefitted are more able to enjoy the pleasures of life.

If a comparatively cheap pavement is desired, without question the brick pavement is the one to select. Considering all the necessary requisites of a good pavement, in almost every instance the brick pavement will fulfill all expectations. A brick pavement made of brick blocks and laid on a concrete base will give excellent results. On streets that are used only for driving, the sheet asphalt pavement can not be surpassed, as it presents a surface that is smooth, noiseless, and dustless thereby presenting an improvement that is pleasing in every respect.

## VI MAXIMUM AND MINIMUM GRADES

The fixing of a proper grade is often the most important factor connected with the construction of a pavement. In establishing the grade, it must be considered both as an ascent and as a descent. The ascent concerns the draught of heavy loads, while the descent concerns the safety of travel.

As an Ascent. The load which a team can draw over any pavement is determined by the length and steepness of the maximum grade. The endurance of a team will permit a stretch of the maximum grade perhaps four hundred feet long, and if this does not come too often, the team could pull the load up a stretch several times as long. In the case of a long maximum grade it is good policy to provide a little stretch of nearly level grade upon which a team may rest. Grades can be made steeper on brick pavement than on any other kind for the reason that a better





foothold for the horses is provided.

As a Descent. Considered as a descent, the maximum grade concerns chiefly the safety of travel. When teams are pulling heavy loads, the teamsters will avoid a steep grade for fear the horses will fall, and the wear on the wagon from using brakes does not compensate for a little saving in time. If the loads are much heavier in one direction than in the other, it is permissible to oppose the lighter traffic with the steeper grade. The following examples of maximum grades for various kinds of pavements will give some idea as to what grades have been established.

Examples of Maximum Grades - Wood Block Pavement.

Rectangular wood blocks with close joints have been used on grades up to three to five per cent. without being seriously slippery. The limit of the grade depends upon the climate, the cleanliness of the pavement, and the character of the wood employed. Duluth, Minnesota, used round wood blocks on a one per cent. grade. London has a limiting grade of four per cent., although several streets in that city are paved with wood blocks on a seven per cent. grade; in Peoria, Illinois, the maximum for wood blocks is two per cent.

Stone Block Pavement. Stone block pavements are laid on grades from one to fifteen per cent.

Asphalt Pavement. Formerly it was assumed that the maximum permissible grade for sheet asphalt pavement was two and one-half per cent., but practise has shown that this figure is too low. At the present time sheet asphalt pavement may be laid on grades of five or six per cent., particularly where the traffic is light. The following table will give a few of the grades used for



sheet asphalt pavement:

<u>City</u>	<u>State</u>	<u>Grade</u>
Peoria	Illinois	7 per cent.
St. Joseph	Missouri	8 per cent.
Scranton	Pennsylvania	13 per cent.
San Francisco	California	16 per cent.
Pittsburgh	Pennsylvania	17 per cent.

Brick Pavement. The steepest grades of brick pavements in actual use in 1900 in a few of the cities of the United States are as follows:

<u>City</u>	<u>State</u>	<u>Grade</u>
Nashville	Tennessee	7 per cent.
Peoria	Illinois	8.4 per cent.
Albany	New York	9.3 per cent.
St. Joseph	Missouri	10.0 per cent.
Des Moines	Iowa	11.0 per cent.
Parkersburg	West Virginia	15.0 per cent.

Steep grades should be avoided as much as possible, and only an examination of the above pavements will furnish the property holder reasons for or against said grades. It is possible that these steep grades were made by property holders who desired a quiet street, or one which traffic would shun.

Minimum Grade. It is not practical to make a pavement perfectly level. In general, it can be said that the minimum grade of a pavement depends upon; (1) provision for proper drainage, (2) the effect upon the abutting property, and (3) the general appearance of the street. But these points have already





been discussed, and hence need not be considered here.

## VII CONCLUSION

It is not uncommon for property holders to be dissatisfied with some features of a pavement in front of their property, either the grade, the width, kind of pavement, or the quality of the pavement; but attention to the various matters outlined above will make the property holders more intelligent on the general subject and will enable them to cooperate more understandingly with the authorities, and thus materially help in securing a satisfactory and efficient pavement. There is probably no part of the citizen's civic duty which so immediately concerns him and which he so uniformly neglects at the proper time and so uniformly condemns when it is too late, as the need of street pavements adjoining his property. The above is submitted with the hope that it may, at least in some degree, prevent this unfortunate state of affairs.











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